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MUSIC AND THE FACTORY WORKER



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MUSIC AND THE FACTORY WORKER*

FORREST H. KIRKPATRICK

RCA Manufacturing Co., and Bethany College

Factors related to the efficiency of factory workers are numerous and complex. Most investigations seem atomistic and feeble to men concerned with the large problems of industrial management. The findings of industrial engineers may indicate, for example, that output appears to be influenced by rest pauses, refreshments during working hours, length of working days, and illumination. The psychologist may find evidence that the worker's output is influenced by knowledge of rest pauses, attitude toward the way he is treated, and sentiments of the work group. Such studies usually examine specific factors and under controlled conditions. There are indications, however, that the more significant factors in worker efficiency are subjective and elusive forces. (15)

Whether or not we accept all of the anecdotal and semi-experimental reports as to music and the factory worker, there is some reason to believe that music tends to relax tension, to add to group morale and *esprit de corps*, and to relieve boredom. Some literature on the effect of music in work situations also emphasizes its facilitating influence. According to legend music has been used to incite action since the time of the early Greeks. Such instances as the use of the marching music or military bands and rhythmic songs of laborers readily come to mind. The use of music in factories seems to follow naturally as an inevitable adaptation in this industrial era. Perhaps it is the modern equivalent of the flute player of olden days who charmed the ears of the Greek ladies as they carried on their tasks. Questions as to its measured effectiveness challenge the psychologist and personnel manager.

Reports as to the use of music, delivered by means of reproduction, amplification and broadcast set-ups indicate positive results in increasing the output and satisfaction of all kinds of workers—industrial laborers, dockhands, and office employees. An examination of the reports usually shows that they are subjective and that they rest mainly

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on the belief that "boredom" is due to a consciousness of uniformity and repetition. The assumption is made therefore that anything that will "take the mind away" will reduce the boredom. The activities most commonly reported to be reinforced by music are the motor processes of industrial operations in which auditory components are lacking or are at a minimum.

Wyatt and Langdon (18) tested the effect of music upon workers engaged in simple repetitive tasks. They were making paper "snappers," the completion of each one requiring about thirty seconds. The output of twelve young workers was recorded at fifteen-minute intervals during the day. Five morning conditions were tested over a period of ninety-five days as follows: Thirty days without music; then fifteen days with seventy-five minutes of music in one single session; then fifteen days with thirty minutes of music followed after half an hour by forty-five minutes of music; then ten days with four thirty-minute periods at half-hour intervals; and finally twenty-five days without music. The music, produced by phonograph, increased the average output, but the amount varied. The largest increase, 6 per cent, resulted from morning music; the smallest, 2.6 per cent, from one period each morning and afternoon; and an intermediate change of 4.4 per cent from four periods in the course of the day. Although the averages show consistent improvement from the music, individuals differed in their reaction to it.

Relative effectiveness of types on output, hardly conclusive because of small number of workers in experiment, is reported in the following order: one steps, fox-trots, waltzes, light classics. Their study of 350 other factory workers revealed that these employees feel that time drags worst during the first two hours of each half of the work day, and that from 77 to 97 per cent of these same workers feel that they can think of other things while they work and that time passes more quickly when they do think of other things. Music's apparent favorable influence upon output is partly due to its ability to add to the imagery in the consciousness of the worker which may be dulled by concentration upon a repetitive task long since mastered.

Humes (9) studied the effects of phonograph music upon the output of eighty-eight female assemblers of radio tubes over a period of many weeks. His interest was focused upon the scrappage rate and its correlation with the presentation of slow music, fast music, mixed programs of slow and fast music, and no music at all. Both slow and

fast music showed less scrappage than the absence of music or than mixed programs. Other results were less clear-cut, the mixed programs, for instance, making for improvement only when certain tube models were being assembled. Employee morale was reported to be higher with music than without it. Humes exercises considerable caution in interpreting his results, pointing out reversals of effect, the specificity of the effect, and also the possibility that non-musical factors might have influenced his results.

Considerably less certain is the favorable effect of music on those operations which require continued mental concentration. Jensen (10) in a school experiment found that typing output was somewhat reduced by jazz and dirge music. It is possible that he might have obtained different results had he applied familiar popular music or soft music as a background. Hevner (7) found that for certain compositions, major modality, fast tempo, high pitch, flowing rhythm, and simple harmony tend to express happiness best. Podolsky (12) has compiled facts which show that music tends in general to increase pulse rate, respiration, and metabolism, lower the threshold for sensory stimuli of different modes, and reduce the regularity of respiration. These conditions are hardly characteristic of the organism when in a state of boredom.

There is, of course, some published opinion to substantiate the partly experimentally confirmed thesis that music has several desirable influences on factory workers. Ramsay, Rawson and others (13) report from a 1939 British survey that 74.5 per cent of employers using music believe that it increases work efficiency. Most of those interviewed reported "impressions" and "believed effects." Wynford Reynolds (14), in charge of a British program, has declared of industrial music—"It is a tonic like a cup of tea, something to cheer the mind. You will get increased output all right, but it will be spread over the work-spell as a whole. You will not necessarily get it while the music is actually being played." According to the British Industrial Welfare Society (14), "On the whole the consensus . . . seems to be that music at work does much to relieve the monotony of repetitive work, and produces a stimulus to increased output, and in the opinion of the Industrial Welfare Society there is no doubt that this development is not merely a wartime one, but that music at work will remain a definite feature of industry." Antrim (1) stated boldly that:

"In plants up and down the land, I have watched workers coming off one shift or going on another with firmer step because of the music. I have seen faces light up when the music comes on in the middle of the day, have heard feet tap and lips sing. 'I like the music,' said a man on a noisy assembly line. 'It's cheerful, and I have more pep when I get home.'"

There is much opinion but little experimental evidence as to the effects of different types of music. Reynolds (14) maintains that British experience indicates that slow waltzes, rhumbas, hot music, music that is too thickly scored, and vocals should be avoided. A survey of British employers using music showed that two-thirds of those reporting want vocals occasionally and a majority prefer men vocalists; fourteen types of broadcast programs received this rank order: light orchestra without vocal, ballroom orchestra without vocal, brass band without vocal, swing orchestra or accordion without vocal, small novelty combination featuring xylophone, band with five vocals, light orchestra dance band without vocal, theatre organ, rhythmic records of light classical music, dance-time records, military band, salon orchestra, dance band, band playing folk songs and dances of another nation. Ramsay, Rawson and others (13) also found that dance music ranked highest in popularity.

Thorpe (17) studied the type preferences of 475 college and high school students after they heard an orchestra play eight types and found that the top four fell into approximately this order: military march, semi-symphony, concert waltz, descriptive piece ("Whispering Flowers"); type preferences were not notably related with intelligence, college grade, or curriculum pursued. Fay and Middleton (3) played four types of classical and two types of popular music over a sound system to 54 college students and the students ranked the types from the most to least pleasant in this order: light classical, old classical, romantic classical, swing, modern classical, and sweet; all were rated as more pleasant than unpleasant. Women rated all types of classical higher than did men. Freyman (14) reports that analysis of 190 replies received from 250 British workers indicates a demand for more modern popular tunes, music-hall songs, dance-time music and waltzes and less light classical, marches, and hot jazz.

All of these 190 replied that they consider music a pleasant background to their work.

Humes (9) concluded from his study that quality of output is generally better under all fast music or all slow music than under programs arranged with pieces proceeding from most to least familiar. After experiencing several months of music, the British factory subjects gave all their votes to fox-trots and waltzes and none to one-steps, marches, or light classical. One-steps, however, appeared to have the most favorable effect on output (18).

In discussing the use of music and rest periods, Ramsay, Rawson and others (13) report on their survey and observation as follows:

"The relationship of official rest-pauses and music in the same factory is of considerable interest, but this inquiry has indicated such varied arrangements of rest-pauses and music that no general practice can be indicated. Of the 47 factories (4.8 per cent) where music was provided at work, 32 also had rest-pauses in operation, while 15 had no rest-pauses. Where respondents were able to state the actual times during which music operated, the majority used it after a rest-pause. The length of time after the rest-pause, however, varied considerably, ranging from half an hour to two and a half hours. The need for refreshments during working hours is indicated by the fact that while only 32 factories had rest-pauses in addition to music at work, 43 had refreshments. Thus, although music may be theoretically regarded in some cases as a substitute for rest-pauses, the need for refreshments may modify the situation in practice. Since it is usually desirable that official rest-pauses should be arranged for the consumption of refreshments, it would appear that music should rather supplement than supplant rest-pauses with refreshments."

Diserens (2) made observations of dynamometer grips, with and without music, but this cannot be considered an experiment conducted under factory conditions. A similar commentary might be made on several other experiments (4, 5, 6, 11) which have, nevertheless, obvious implications for industry. Seashore (16) stated something of an apologetic for music and the factory worker when he said:

"Why then do we love music? Among other things it creates a psychological well-being in our organism; it is built from materials which are beautiful objects in themselves; it carries us through the realms of creative imagination, thought, actions, and feelings in limitless art forms; it is self-propelling through natural impulses, such as rhythm; it is the language of emotion, a generator of social fellowship; it takes us out of the humdrum of life and makes us live in play with the ideal; it satisfies our cravings for intellectual conquest, for isolation in the artistic attitude of emotion, and for self-expression for the joy of expression."

It seems fair to conclude after a survey of experimental literature that no significant or conclusive research has been published concerning the effect of music on the output or health of factory workers. There is good reason to believe that the use of music relieves boredom and that it facilitates socializing. There is a general agreement on the part of management that, properly controlled, music may increase happiness and contentment in work, improve output and lessen fatigue. Opinions from management experience and experimental evidence seem to indicate (1) That music is most often appreciated by workers who perform repetitive manual tasks which require little mental concentration. (2) That music should be "turned on" only for comparatively short periods and at times when fatigue or boredom seem most certain. (3) That its loudness should be carefully controlled for each individual workroom, so that the sound of the music may emerge from the background of the general or particular shop noises and not create marked differences of intensity by contrast with the noise of the machinery in the shop. (4) Music is a hindrance to those types of work which demand mental concentration. (5) As a general rule, two or perhaps three periods of music of about half an hour's duration appear to produce the most satisfactory results.

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PSYCHOLOGICAL EFFECTS OF MUSIC AS REPORTED BY 162 DEFENSE TRAINEES

W. A. KERR

RCA Manufacturing Co.

Feelings about Music, a scale containing six horizontal feeling continuums, was administered to 162 male trainees at the Defense Training Center of Arsenal Technical Schools, Indianapolis. These men, ranging in age from 17 to 57 with an average age of 23.87, were enrolled in mechanic learner and junior repairman courses in the Signal Corps Radio School. They are of slightly above average economic status, 90 per cent of them are white, and they were being trained for maintenance of army communications equipment. This study had as its purpose the determination of believed psychological effects of music as reported by a group of adult male technical workers.

The six items in the scale attempt to obtain indications of believed effect of music on feelings toward associates, feeling when tired, nerves, digestion, feelings when on wearisome, monotonous work, and worries. Each item is phrased in neutral language and the descriptive expressions used under each of the six continuums are balanced for positive and negative gradient value. The scale, including tabulation information items, was administered to the trainees during the regular class periods. Each subject was simply directed to place a check mark at the point on each of the six gradient continuums which best represented his belief. "Music" was not defined and no particular type of music was specified since spontaneous, central opinions of respondents were desired. Answers were anonymous.

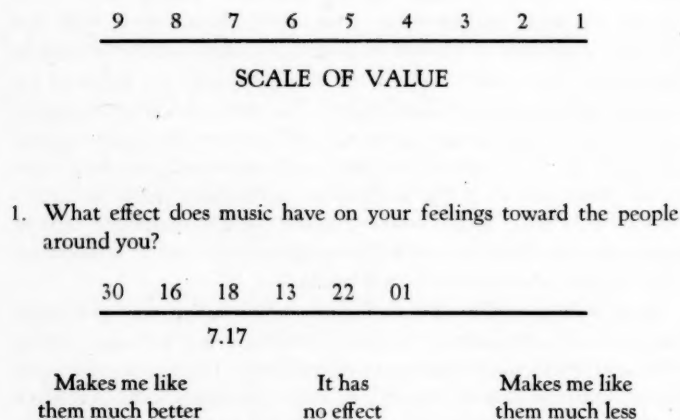
Each feeling continuum (see Figure 1) was scored on a nine-point basis, 1 being extremely unfavorable, 5 indifferent, 9 extremely favorable, and intervening numbers as interpolated. Highest possible score for the entire scale is 54, lowest is 6, and a completely indifferent score is 30. Actual obtained scores ranged from 27 to 54 with a mean score of 44.02 and a standard deviation of 7.00. Ninety-six per cent of the

trainees indicated belief in desirable psychological effects of music by yielding total scores above 30.

Responses to the six items are indicated in Figure 1 along with mean score obtained for each item. The difference between each of these means and their respective indifference points is statistically significant. It is apparent from inspection of Figure 1 that a huge majority of the respondents believe that music improves their feelings toward the people around them, braces them up when tired, soothes their nerves, helps them at wearisome, monotonous work, and makes them forget their worries. A smaller majority believe that music aids their digestion. Incidentally, Podolsky (4) reports desirable physiological effects from application of music.

FIGURE 1

Per Cent of 162 Defense Trainees Checking Each Scoring Position on Each Continuum and Mean Score on Each Continuum



2. How does music make you feel when you are tired?

44 23 14 08 09 01 01

7.77

Always braces
me up

It has
no effect

Always makes
me worse

3. What effect does music have upon your nerves?

40 23 16 09 11 01

7.67

Always soothes
them

It has
no effect

Always irri-
tates them

4. What effect does music have upon your digestion?

23 11 11 10 41 03 01

6.55

Always helps it

It has
no effect

Always dis-
turbs it

5. How does music make you feel when you are working at a wearisome, monotonous task?

56 18 15 01 06 01 01 01

7.98

Always helps me

It has
no effect

Always bothers
me

6. What effect does music have upon your worries?

35	14	25	11	13	01	01
<hr/>						
7.37						

Always makes me
forget them

It has
no effect

Always makes
them worse

A summary of these results is given in Table 1 where the "Unfavorable" column is a total of all 1, 2, 3, and 4 responses to each item, "Indifferent" refers to all 5 responses, and "Favorable" is a total of all 6, 7, 8, and 9 responses.

TABLE 1.

Summary of Three Types of Responses to Each Item

Item	Per Cent Favorable	Per Cent Indifferent	Per Cent Unfavorable
1	76.8	21.9	01.3
2	89.7	08.3	02.0
3	87.5	11.2	01.3
4	55.7	41.2	03.1
5	90.1	05.6	04.3
6	85.1	13.1	01.8

Split-half reliability of the scale is .73 when stepped up by the Spearman-Brown prophecy formula. Tetrachoric intercorrelations (see Table 2) between the six items range from —.04 to .79, but each item correlates .67 or higher with at least one other item, indicating that the lowest inter-r's should not be attributed to unreliability of items; more than one variable is being measured. In order to test this latter hypothesis, a factor analysis, using the methods of Thurstone (1) was performed.

TABLE 2

*Intercorrelations Between the Items in the Feelings
About Music Scale*

Items:	1	2	3	4	5	6
1		.67	.66	.68	.27	.73
2			.67	.05	.14	.77
3				.61	.67	.79
4					-.04	.60
5						.46

TABLE 3

*Factor Loadings, Communality, and Uniqueness for Each
Item in the Feelings Scale*

Item	Factor One	Factor Two	h^2	u^2
1	.23	.87	.81	.19
2	.26	.67	.52	.48
3	.81	.55	.96	.06
4	.15	.61	.39	.61
5	.78	.00	.61	.39
6	.43	.84	.89	.11

Factor loadings after one plane rotation are shown in Table 3 along with the communality and uniqueness of each item. Factor I is tentatively labeled a *personal efficiency* effect since Item 5 is heavily loaded with this factor and Item 3 which refers to effect on nerves is also weighted with it. Kirkpatrick (3) has pointed out that "The instinct with which the repetitive work of modern industry is

said to come into conflict most seriously and most frequently is that of workmanship or creativity. . . . He may experience . . . a pronounced feeling of boredom . . . an expression of monotony." If boredom arising from monotonous work on a task long since mastered is due to "nerves going to waste" through inactivity, then the weighting of Item 3 on the personal efficiency factor makes excellent psychological sense. Monotonous work tends to reduce the efficiency of the worker, but music may give direction to loitering nerves of the worker and thus blot out monotony by supplying positive affective stimuli which revive and direct dulled or "sleeping" areas within the organism. Both Wyatt and Langdon (5) and Humes (2) found an increase in factory production resulting from use of music.

Factor II is tentatively labeled *morale* effect because Items 1 and 6 are most heavily weighted with this factor while Item 2 also carries a substantial weighting; pleasant feelings toward associates and few worries are generally considered extremely important characteristics of morale; Items 2 and 4 contribute less to Factor I than to Factor II and most of the variance in each is not accounted for by either Factor I or Factor II. The analysis was not carried beyond the second factor because the mean second factor residual is not significant (C.R.=1.27).

Correlations computed between total score on the *Feelings about Music* scale and other variables include the following: age — $.17 \pm .05$, musical background $.18 \pm .05$, number of months of work experience with music $.34 \pm .04$. All of these *r*'s are significant at the 5% level or better.

SUMMARY

1. Trainees in a signal corps radio school express an overwhelming confidence in certain psychological powers of music; 77% think it improves their feelings toward associates; 90% believe it helps them when tired; 88% say it soothes their nerves 56% think it helps their digestion; 90% believe it helps them in performing a wearisome, monotonous task; 85% say it helps make them forget their worries.

2. Ninety-six per cent reported a favorable average belief in the psychological effects of music.

3. Item intercorrelations range from $-.04$ to $.79$. Item reliability is satisfactory. Reliability of the total instrument is $.73$ for the subjects measured.

4. Factor analysis indicates that two factors, tentatively labeled *personal efficiency* and *morale*, are present in the responses. These findings tend to be confirmed by observed behavior of employees in industrial situations where recorded music is broadcast.

5. A correlation of $-.17$ exists between age and belief in the psychological effects of music.

6. A correlation of $.18$ exists between musical background and belief in the effects of music.

7. A correlation of $.34$ exists between work experience with music and belief in the effects of music.

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FACTOR ANALYSIS OF 229 ELECTRICAL WORKERS' BELIEFS IN THE EFFECTS OF MUSIC

W. A. KERR

RCA Manufacturing Co., Inc.

Since the introduction of music—by means of public address systems—into factory or industrial work-settings, considerable interest has been expressed by men in science, management, and labor as to effects, if any, that music has upon the individual worker. Consensus of management, confirmed in part by experimental evidence (2, 7), seems to be that music, particularly in monotonous tasks, increases worker satisfaction and production. It is the purpose of this study to measure the believed psychological effects of music as reported by 229 electrical workers and to evaluate the broader meaning of the obtained configuration of beliefs.

Feelings About Music, a scale containing six horizontal feeling continuums, was administered to 205 radio tube workers and 24 electrical assembly workers in one of the plants of the RCA Manufacturing Company. Ninety-seven per cent of these 229 white workers are female, and their ages range from 18 to 47 with an average of 23.15.

Each employee was asked to give name, age, sex, and musical background. The latter measure was obtained by asking each respondent to "Check the following which apply to you: A. Can read printed music —. B. Have had lessons in music —. C. Can play musical instrument —. D. Play records at home —. E. Listen to music programs on the radio —." A measure of individual production efficiency on the job was obtained for 166 of the tubes employees from officials of the Department, this measure being based upon actual production records and adjusted for experience and type of operation.

Tube employees are familiar with industrial music because it has

been broadcast rather regularly throughout their department for several years. Once during the summer of 1942 when music was stopped for two weeks in order to alter the public address system, supervisors in the department received many complaints requesting that the music be restored.

FIGURE 1

Per Cent of 229 Electrical Workers Checking Each Scoring Position on Each Continuum and Mean Score on Each Continuum

	9	8	7	6	5	4	3	2	1
<hr/>									
SCALE OF VALUE									
1. What effect does music have on your feelings toward the people around you?									
	19	25	11	09	32	04			
	<hr/>								
	6.73								
Makes me like them much better				It has no effect			Makes me like them much less		
2. How does music make you feel when you are tired?									
	47	31	10	05	06		01		
	<hr/>								
	8.04								
Always braces me up				It has no effect			Always makes me worse		

3. What effect does music have upon your nerves?

28 29 14 08 15 04 01 01

7.24

Always soothes
them

It has
no effect

Always irri-
tates them

4. What effect does music have upon your digestion?

11 12 09 15 44 07 01

6.08

Always helps it

It has
no effect

Always dis-
turbs it

5. How does music make you feel when you are working at a wearisome, monotonous task?

38 34 13 04 06 01 03 01

7.74

Always helps me

It has
no effect

Always bothers
me

6. What effect does music have upon your worries?

23 33 15 06 17 04 02

7.18

Always makes me
forget them

It has
no effect

Always makes
them worse

Each feeling continuum (see Figure 1) was scored on a nine-point basis, 1 being extremely unfavorable, 5 indifferent, and 9 extremely favorable with intervening numbers as interpolated. Highest possible score for the entire scale is 54, lowest is 6, and a completely indifferent score is 30. Actual obtained scores range from 29 to 54 for the total group with a mean of 43.00 for the tube group and a mean of 42.54 for the electrical assembly group; this difference in means when divided by its standard error is .35 which is not significant. Ninety-seven per cent of the tube workers and 88 per cent of the electrical assembly employees indicated belief in desirable psychological effects of music by yielding total scores above 30.

Responses of the 229 workers to the six items are indicated in Figure 1 along with mean score obtained for each item. It is apparent from inspection of Figure 1 that a majority of the respondents believe that music improves their feelings toward associates, braces them up when tired, soothes their nerves, helps them at wearisome, monotonous work, and makes them forget their worries. A significantly larger percentage believe music to be helpful than believe it to be harmful to their digestion.

A summary of these results is given in Table 1 where the "Unfavorable" column is a total of all 1, 2, 3, and 4 responses to each item, "Indifferent" refers to all 5 responses, and "Favorable" is a total of all 6, 7, 8, and 9 responses.

TABLE 1
Summary of Three Types of Responses to Each Item

Item	Per Cent Favorable	Per Cent Indifferent	Per Cent Unfavorable
1	63.8	32.1	04.1
2	93.0	06.1	00.9
3	79.3	15.0	05.7
4	47.5	44.3	08.1
5	89.1	05.7	05.2
6	77.2	16.7	06.1

Split-half (odd versus even items) reliability of the scale for these 229 cases is .82 when stepped up by the Spearman-Brown prophecy formula. Tetrachoric intercorrelations (see Table 2) among the six items for the 205 tube employees range from .22 to .70 and each item correlates .57 or higher with at least one other item. In order to test the hypothesis that more than one variable is being measured, a factor analysis, using the methods of Thurstone (1) was performed.

TABLE 2
*Intercorrelations Between the Items in the Feelings
About Music Scale*

Items:	1	2	3	4	5	6
1		.56	.52	.57	.22	.29
2			.70	.46	.60	.62
3				.49	.52	.44
4					.47	.57
5						.28

TABLE 3
*Factor Loadings, Communality, and Uniqueness for Each
Item in the Feelings Scale*

Item	Factor One	Factor Two	Factor Three	h^2	u^2
1	.626	.103	.319	.505	.495
2	.813	.280	.158	.764	.236
3	.732	.376	.094	.686	.314
4	.684	.324	.005	.573	.427
5	.594	.243	.394	.567	.433
6	.579	.505	.309	.685	.315

Factor loadings after two plane rotations are shown in Table 3 along with the communality and uniqueness of each item. Factor I, tentatively labeled *physiological* effect, is contained most heavily in Items 2, 3, and 4 which refer to tiredness, nerves, and digestion. The second factor is called *social efficiency* effect because it is contained most in the items referring to worries, nerves, and digestion, implying presence of both morale and physiological elements. The third factor, cautiously called *morale* effect, has a mean second factor residual which is not quite as large as its standard error but is included in this summary because, first, an extremely small proportion of the total variance for each item is accounted for by Factors I plus II, and, second, there is some disagreement on the extent to which a factor analysis should be carried. It is possible that a more valid and reliable set of ratings from a larger industrial group might confirm the existence of a third factor; at present this factor should be regarded as suggestive rather than as statistically significant. It is apparent of course that completely independent simple structure does not exist in these two obtained and one hypothetical factor, yet Factors I and II are independent enough to justify separate interpretation.

TABLE 4
Correlations Between Total Feeling Score and
Certain Other Variables

Variable:	1	2	3	4
1. Total Feelings About Music Score		.28	.10	.08
2. Production			.18	-.09
3. Age				-.22
4. Musical Background				
$r_{12.3} = .11$		$r_{12.4} = .29$		

While the naming of factorial clusters calls for psychological insight and interpretation, there exists in this area of research a body of independent objective evidence to lend direction and credence to

the psychological interpretation. Podolsky (4, 5) cites a mass of experimental and clinical medical evidence to support the belief that music actually does have marked physiological effects upon the listening organism. The extent to which these physical reactions are of predominantly psychological or predominantly physiological origin is probably more an academic than practical problem. Probably most evidence on the psychological effects of music points toward a Gestalt interpretation of the music-hearing organism. Some reputable doctors (6) declare that worry is an important cause of stomach ulcer; if this is true and if music in the factory is able to reduce worry, then the potential psycho-physiological effects of music need further study and development.

Kurt Lewin (3), in a work experiment designed to discover the point of "psychic satiation", discovered that reading the same poems repeatedly or drawing simple patterns continuously caused the mental breaking point to occur long before any decrement in the rate of output appeared; the subjects tended to compensate by varying the nature of their responses—which is usually the same as decreasing accuracy. This may be a key to the success of music in the factory situation, as well as an explanation of the weighting of Item 3 on the social efficiency factor; music by definition is a pattern of varying, pleasant, affective stimuli—and when these stimuli enter the environment of the worker on a monotonous task, it is possible that the invention of new work habits or movements as observed by Lewin may cease. In this way music would come as a relief to nerves fatigued by boredom. Another factor to be considered is the disorganizing effect of worry; presumably music can also "soothe" nerves by making the work atmosphere more pleasant so that probability of excessive worry about personal problems is reduced.

Intercorrelations among total *Feelings About Music* score, production, age, and musical background for 166 tubes workers ranging in age from 18 to 30 for whom data were available are shown in Table 4. Three of these correlations are statistically significant at the 5 per cent level or better. There is a significant tendency for those who have greatest belief in the desirable effects of music to be better producers on the job. When the effect of age (which in this case may almost imply work experience since the oldest worker is only 30) is held constant, the correlation between belief and production is reduced to .11. Musical background has no effect on the correlation between belief and

production. There is a slight suggestion in these data that the more experienced workers tend to be both more favorable toward the effects of music and better producers than the less experienced workers and that in the process of gaining industrial music experience employees tend also to acquire greater belief in the effects of music; these latter suggestions need additional study for confirmation because they may result from operation of a selective factor.

CONCLUSIONS

1. A group composed of 205 radio tube workers and 24 electrical assembly workers express an overwhelming confidence in certain psychological powers of music; 64 per cent think it improves their feelings toward associates; 93 per cent believe it helps them when tired; 79 per cent say it soothes their nerves; 48 per cent think it helps their digestion; 89 per cent believe it helps them in performing a wearisome, monotonous task; 77 per cent say it helps make them forget their worries.

2. Ninety-five per cent reported a favorable average belief in the psychological effects of music.

3. Item intercorrelations range from .22 to .70. Item reliability is satisfactory for group interpretation. Reliability of the total instrument is .82 for the subjects measured.

4. Factor analysis indicates that two factors, tentatively labeled physiological effect and social efficiency, are present in the responses, while a trace suggests possibility of a third factor believed to be morale.

5. A correlation of .28 exists between production on the job and belief in the psychological effects of music. This r is reduced to .11 when age is held constant. Musical background does not influence the correlation between production and feelings about music for this group.

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